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10/511,785	07/25/2005	Linda Lefevre	Serie 6048	4802

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Linda K Russell
Air Liquide
Intellectual Property Department
Suite 1800 2700 Post Oak Boulevard
Houston, TX 77056

EXAMINER	
CHEN, CHRISTINE	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/511,785	LEFEVRE ET AL.	
	Examiner	Art Unit	
	CHRISTINE CHEN	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 March 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16,17,19-22 and 24-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16,17,19-22 and 24-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 March 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Status

Claims 16-17, 19-22, 24-31 are pending wherein claims 18 and 23 are cancelled.

Status of Previous Rejections

The previous objection to the drawings has been withdrawn. The rejection of claims 15, 16, 17, 23 and 28 under 35 U.S.C. 102(a) as being anticipated by Van den Sype (US 2002/0104589) has been withdrawn. The rejection of claims 18-22 and 24-29 under 35 U.S.C. 103(a) as being unpatentable over Van den Sype (US 2002/0104589) in view of Wandke (EP 1050592) has been withdrawn.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 30 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase “group comprising” in line 4 of claim 30 renders the scope of the claim unclear. The phrase "group" narrows the scope but the phrase "comprising" is open-ended.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 29 is rejected under 35 U.S.C. 102(b) as being anticipated by Wunning (US 5452882).

Wunning discloses a method for quenching metallic work pieces with a pressurized cooling gas in an apparatus. In an example, Wunning discloses cooling a roller bearing ring with a cooling gas, wherein said cooling gas includes 20 vol. % CO (infrared absorbing gas) and 40 vol. % hydrogen (see col. 12 Example, particularly Variant I). Since the composition of the prior art cooling gas is within the composition of the claimed range, it would read on the claimed limitation of step (b), adjusting the composition of said cooling gas so that significant later changes to said apparatus are unnecessary.

3. Claims 16-17, 22, 24, and 30-31 are rejected under 35 U.S.C. 102(a) as being anticipated by Stratton (WO 02/44430).

Stratton discloses a method wherein a cooling gas mixture comprising 12-20 vol. % CO and 25-40 vol. % hydrogen is compressed t o a pressure up to 10 bar gauge and cooled to a temperature less than 50°C (see page 3 paragraphs 3 and 4, and page 4 paragraph 3). Given these conditions of pressure and temperature, it would be expected that said cooling gas meets the claimed limitation of adjusting the composition to obtain an average mixture density that is approximately the same as that of nitrogen. Given the presence of hydrogen, the superiority of the convective heat transfer properties of the mixture to those of nitrogen in similar cooling conditions would be

inherent. The property of convective heat transfer is dependent on the fluid. In addition, hydrogen is known for its high conductive property.

With regards to the supplementary gas required by claim 17, Stratton's gas mixture additionally includes nitrogen and water vapor.

With regards to the content of absorbing gas recited in claim 24, Stratton discloses 12-20 vol. % of CO, which is within the range of claim 24, thereby anticipating the claimed range.

With regards to the phrases of intended use recited in claim 31, such as "in order to improve the heat transfer to the part by combining radiative and convective heat transfer phenomena and to improve the convective heat transfer coefficient," the improvement in heat transfer by combining radiative and convective heat transfer phenomena and the improvement in the convective heat transfer coefficient in comparison with conventional conditions of cooling under nitrogen would be inherent. Radiative and convective heat transfer phenomena are dependent on the fluid. The convective heat transfer coefficient is also dependent on the fluid.

Similar reasoning is provided for having an additive gas having a good convective heat transfer capability and selected from helium, hydrogen, and mixtures thereof. The property of convective heat transfer capability is dependent on the fluid. In addition, hydrogen is known for its high conductive property.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stratton (WO 02/44430).

With regards to the content of absorbing gas recited in claim 25, Stratton discloses CO in an amount of 12-20 vol. % as shown in paragraph 3 above, which overlaps with the claimed range. It would have been obvious to one of ordinary skill in the art to select an amount of CO from the claimed range in order to optimize the infrared radiation absorptive properties of the cooling gas mixture.

6. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stratton (WO 02/44430) in view of Baxter (US 5173124).

Stratton does not disclose adjusting the composition of the gas mixture to optimize the mixture's convective heat transfer coefficient.

Baxter, in examining improved cooling rates by flowing gases over the articles to be cooled, discloses that there is an increase in the convective heat transfer coefficient in applying a helium and argon gas quench mixture wherein helium is present in an amount equal to at least 59% by volume of the mixture (col.5 lines 35-46 and col. 6 line 12-14 and Figure 4). As shown in Figure 4, the convective heat transfer coefficient is optimized at 80% He and 20% Ar. A lower value for the convective heat transfer coefficient is shown at 100% He and 100% Ar. Examiner interprets this as Baxter disclosing the optimization of a mixture's convective heat transfer coefficient by

adjusting the composition of a gas mixture as compared to the individual convective heat transfer coefficients of each component in said mixture.

It would have been obvious to one of ordinary skill in the art to apply Baxter's step of adjusting the composition to the method of Stratton in order to optimize the quenching ability of the gas mixture.

7. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stratton (WO 02/44430) in view of Andersson (US 5938866).

Stratton does not disclose recycling of the quenching gas.

Andersson, in disclosing a method for the treatment of components by a gas mixture, discloses the recycling of a gas mixture, wherein helium quenching gas and remnants of nitrogen gas from a previous heat treatment are compressed in a compressor 25 and purified by purification columns 29 and 30 allowing for the recovery of nitrogen for subsequent use (see col. 4 line 57-col. 6 line 31).

It would have been obvious to one of ordinary skill in the art to apply Andersson's steps of compression and purification to the method of Stratton in order to facilitate the recycling of a quenching gas thereby increasing the efficiency of the installation system.

8. Claims 16-17, 20-22, 24-27 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wandke (EP 0869189 Machine Translation) combined with Boyer (US 5798007) and Lemken (US 6428742) and Nakamura (JP 63149313).

Wandke discloses a method for gas quenching metal workpieces wherein the method includes the use of a pressurized cooling gas mixture which may preferably

comprise carbon dioxide in addition to hydrogen, helium, or mixtures of hydrogen and helium (see abstract, Description section first paragraph, and p. 2 paragraph 2).

Given the presence of hydrogen, helium, or mixtures of hydrogen and helium, the superiority of the convective heat transfer properties of the mixture to those of nitrogen in similar cooling conditions would be inherent. The property of convective heat transfer is dependent on the fluid. In addition, hydrogen and helium are known for their high conductive properties.

Wandke does not disclose adjusting the composition to obtain an average mixture density that is approximately the same as that of nitrogen.

Boyer, in discussing a quenching section of a furnace, discloses that in filling the section with hydrogen or helium instead of nitrogen, the size of the fans may be altered (see col. 4 lines 25-35). Examiner interprets this as the quenching medium affecting the quenching installation. In other words, quenching installations are designed for a particular quenching medium.

Lemken, in teaching a quenching installation and particularly describing a situation of low motor power, discloses that although the motor power is reduced, it is sufficient for the density of the cooling gas associated therewith (see col. 2 lines 32-36). Examiner interprets this as the density of the cooling gas associated therewith affecting the design and strength of the quenching installation in terms of power.

Nakamura discloses a gas quenching furnace for cooling metal, wherein a coolant nitrogen gas is circulated in a closed vessel 1 via a circulating fan 12 (see English abstract and Figure 1).

The combination of Boyer, Lemken, and Nakamura teaches a gas quenching furnace designed for the quenching gas of nitrogen, wherein the density of nitrogen is taken into account in said design.

It would have been obvious to one of ordinary skill in the art to modify Wandke's method with the teachings of Boyer, Lemken, and Nakamura by including a step of adjusting the composition to obtain an average mixture density that is approximately the same as that of nitrogen in order to apply Wandke's gas mixture in a gas quenching installation designed for nitrogen.

With regards to the supplementary gas recited in claim 17, examiner interprets the helium, hydrogen, and mixtures thereof disclosed by Wandke above as being a supplementary gas.

With regards to the steps of cooling said parts in a vessel and adjusting the composition of said mixture as required by claim 20, the quenching furnace (vessel) of Nakamura includes a circulating fan (gas stirring system) as disclosed above.

As discussed above, the combination of Boyer, Lemken, and Nakamura teaches a gas quenching furnace designed for the quenching gas of nitrogen, wherein the density of nitrogen is taken into account in said design.

It would have been obvious to one of ordinary skill in the art to modify Wandke's method with the teachings of Boyer, Lemken, and Nakamura by including a step of adjusting the composition to obtain an average mixture density that is approximately the same as that of nitrogen in order to apply Wandke's gas mixture in a gas quenching installation designed for nitrogen.

With regards to the step of adjusting the composition so that endothermic chemical reactions can occur as required by claim 21, Wandke discloses that the gas mixture may comprise up to 30 vol. % carbon dioxide (see p. 2 paragraph 2).

Given said disclosure, it would have been obvious to one of ordinary skill in the art to pick a vol. % of carbon dioxide within the disclosed range in order to apply an effective gas quenching medium. Given any vol. % of carbon dioxide chosen, it is apparent that endothermic chemical reactions are capable of occurring between carbon dioxide and hydrogen, helium, of a mixture of hydrogen or helium.

With regards to the volume % of absorbing gas as recited in claims 24 and 25, as discussed above, Wandke discloses that the gas mixture may comprise up to 30 vol. % carbon dioxide (see p. 2 paragraph 2), which overlaps with the claimed ranges of claim 24 and 25. It would have been obvious to one of ordinary skill in the art to select an amount of carbon dioxide from Wandke's disclosed range in order to optimize the infrared radiation absorption properties of the gas mixture.

With regards to the binary mixtures required by claims 26 and 27, as discussed above, Wandke discloses the use of a pressurized cooling gas mixture which may preferably comprise carbon dioxide in addition to hydrogen, helium, or mixtures of hydrogen and helium (see abstract, Description section first paragraph, and p. 2 paragraph 2).

Given said disclosure, it would have been obvious to one of ordinary skill in the art to select a binary carbon dioxide and helium mixture as recited in claim 26 or a

binary carbon dioxide hydrogen mixture as recited in claim 27 in order to apply an effective gas quenching mixture.

Still regarding claims 26 and 27, a discussion of the volume % of carbon dioxide disclosed by Wandke and its relation to the claimed volume % is found above in the discussion of claims 24 and 25.

9. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Wandke (EP 0869189 Machine Translation) and Boyer (US 5798007) and Lemken (US 6428742) and Nakamura (JP 63149313) in view of Baxter (US 5173124).

None of Wandke, Boyer, Lemken, and Nakamura disclose adjusting the composition of the gas mixture to optimize said mixture's convective heat transfer coefficient as compared to the individual convective heat transfer coefficients of each component of said mixture.

Baxter, in examining improved cooling rates by flowing gases over the articles to be cooled, discloses that there is an increase in the convective heat transfer coefficient in applying a helium and argon gas quench mixture wherein helium is present in an amount equal to at least 59% by volume of the mixture (col.5 lines 35-46 and col. 6 line 12-14 and Figure 4). As shown in Figure 4, the convective heat transfer coefficient is optimized at 80% He and 20% Ar. A lower value for the convective heat transfer coefficient is shown at 100% He and 100% Ar. Examiner interprets this as Baxter disclosing the optimization of a mixture's convective heat transfer coefficient by

adjusting the composition of a gas mixture as compared to the individual convective heat transfer coefficients of each component in said mixture.

It would have been obvious to one of ordinary skill in the art to apply Baxter's step of adjusting the composition to the method of Wandke modified by Boyer, Lemken, and Nakamura in order to facilitate the quenching ability of the gas mixture.

10. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over combination of Wandke (EP 0869189 Machine Translation) and Boyer (US 5798007) and Lemken (US 6428742) and Nakamura (JP 63149313) in view of Andersson (US 5938866).

None of Wandke, Boyer, Lemken, and Nakamura disclose recycling of the quenching gas.

Andersson, in disclosing a method for the treatment of components by a gas mixture, discloses the recycling of a gas mixture, wherein helium quenching gas and remnants of nitrogen gas from a previous heat treatment are compressed in a compressor 25 and purified by purification columns 29 and 30 allowing for the recovery of nitrogen for subsequent use (see col. 4 line 57-col. 6 line 31).

It would have been obvious to one of ordinary skill in the art to apply Andersson's steps of compression and purification to the method of Wandke modified by Boyer, Lemken, and Nakamura in order to facilitate the recycling of a quenching gas thereby increasing the efficiency of the installation system.

11. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wandke (EP 0869189 Machine Translation) combined with Boyer (US 5798007) and Lemken (US 6428742) and Nakamura (JP 63149313).

As disclosed in paragraph 8 above, Wandke discloses a method for quenching metal workpieces using a pressurized gas mixture wherein the cooling gas mixture may preferably comprise carbon dioxide in addition to hydrogen, helium, or mixtures of hydrogen and helium. Additionally, the carbon dioxide is not to exceed 30 vol. % (see abstract, Description section first paragraph, and p. 2 paragraph 2).

With regards to the vol. % of carbon dioxide, Wandke's disclosed range overlaps with the claimed range. It would have been obvious to one of ordinary skill in the art to select an amount of carbon dioxide from Wandke's disclosed range in order to optimize the infrared radiation absorption properties of the gas mixture.

The improvement in heat transfer by combining radiative and convective heat transfer phenomena and the improvement in the convective heat transfer coefficient in comparison with conventional conditions of cooling under nitrogen would be inherent. Radiative and convective heat transfer phenomena are dependent on the fluid. The convective heat transfer coefficient is also dependent on the fluid.

Similar reasoning is provided for having an additive gas having a good convective heat transfer capability and selected from helium, hydrogen, and mixtures thereof. The property of convective heat transfer capability is dependent on the fluid. In addition, hydrogen and helium are known for their high conductive properties.

Wandke does not disclose adjusting the composition to obtain an average mixture density that is approximately the same as that of nitrogen.

Boyer, in discussing a quenching section of a furnace, discloses that in filling the section with hydrogen or helium instead of nitrogen, the size of the fans may be altered (see col. 4 lines 25-35). Examiner interprets this as the quenching medium affecting the quenching installation. In other words, quenching installations are designed for a particular quenching medium.

Lemken, in teaching a quenching installation and particularly describing a situation of low motor power, discloses that although the motor power is reduced, it is sufficient for the density of the cooling gas associated therewith (see col. 2 lines 32-36). Examiner interprets this as the density of the cooling gas associated therewith affecting the design and strength of the quenching installation in terms of power.

Nakamura discloses a gas quenching furnace for cooling metal, wherein a coolant nitrogen gas is circulated in a closed vessel 1 via a circulating fan 12 (see English abstract and Figure 1).

The combination of Boyer, Lemken, and Nakamura teaches a gas quenching furnace designed for the quenching gas of nitrogen, wherein the density of nitrogen is taken into account in said design.

It would have been obvious to one of ordinary skill in the art to modify Wandke's method with the teachings of Boyer, Lemken, and Nakamura by including a step of adjusting the composition to obtain an average mixture density that is approximately the

same as that of nitrogen in order to apply Wandke's gas mixture in a gas quenching installation designed for nitrogen.

12. Applicant's arguments with respect to claims 15-29 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHRISTINE CHEN whose telephone number is (571)270-3590. The examiner can normally be reached on Monday-Friday 8:30am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/

Supervisory Patent Examiner, Art Unit 1793

CC